December 6, 1866.

Lieut.-General SABINE, President, in the Chair.

The President announced that he had appointed the following Members of the Council to be Vice-Presidents:—

The Treasurer,
Mr. Bowman,
Mr. Spottiswoode,
Vice-Chancellor Sir W. Page Wood.

The following communications were read:—

I. "Discussion of Tide-Observations at Bristol." By T. G. Bunt, Esq. Communicated by the Astronomer Royal. Received October 24, 1866.

(Abstract.)

This Paper contains the results of a Discussion of about 19,000 observations of Times and Heights of High Water at Bristol, for the purpose of obtaining the Empirical Laws of the Diurnal Inequalities of the Times and Heights, and of the Solar Inequality of the Times, of the tides at that port. Curves on Diagrams which accompany the Paper exhibit the results.

The Observations were taken by a Self-registering Tide-Gauge, the Clock of which has from the first been regulated by transit observation.

The Diurnal Inequalities of the tides at Bristol are not large, that of time averaging only 2 minutes (earlier or later), and that of height $2\frac{1}{2}$ inches (greater or less).

Although it was stated by Sir John W. Lubbock (in 1839) that the diurnal inequality in time is too minute to be observed on our coasts, the slightest examination of the Diagram (No. 4) will be sufficient to show that this remark is inapplicable to Bristol. On this diagram are laid down the times and heights of tide registered there during six months of the year 1865. In consequence of the tranquil state of the weather, the agreement of the observed with the predicted times was unusually close; the average error in time, during the six months, being only $2\frac{1}{2}$ minutes, and for six weeks less than 1·9 minute. The diurnal inequality, of time as well as of height, is throughout the diagram most conspicuous; and the agreement of the calculated with the observed inequality close and satisfactory.

For each of the Diurnal Inequalities, the residues, or errors, of the calculated Times and Heights were arranged for every half month, and for each of the twenty-four hours of Lunar transit, making ($24 \times 24 =$) 576 Groups. The averages of these, laid down in Curves, are shown in Diagrams No. 1 and 2.

Diagram No 3 shows the Solar Inequality of Time, obtained in a similar

manner, together with curves of the separate effects of the Solar Parallax and Solar Declination.

A sheet from the Tide-Gauge Cylinder has also been sent, as a specimen of the regularity of the registered Curves in tranquil weather.

II. "On the Heating of a Disk by rapid Rotation *in vacuo*." By Balfour Stewart, M.A., F.R.S., and P. G. Tait, M.A. (Continuation of a Paper read before the Royal Society on June 15, 1865, and published in the 'Proceedings.') Received October 30, 1866.

16. The apparatus and certain preliminary experiments having been described in the previous paper, the authors now proceed to relate what further experiments have been made.

In the preliminary experiments it was conclusively shown (art. 8) that the effect on the pile caused by rotation of the disk was due to radiant heat, and also (art. 9) that this effect was not due to the heating of the rock-salt, which in most of the experiments was placed before the mouth of the cone.

It was also rendered probable that the effect was not due to radiation from heated air, by the two following considerations:—

(1) Because in order that nearly dry air of such a tenuity might give such a radiation it would require to be heated enormously.

(2) Because when the lampblack was removed from the aluminium disk, leaving it a rough metallic surface, the indication afforded by the galvanometer was reduced to about one-fourth of the amount with the blackened disk.

The following observations tend to strengthen this proof:—

(3) The heating effect is the same in hydrogen or in coal-gas as in air, although there is no question that the absorptive, and therefore the radiative power of coal-gas is much greater than that of air. This is shown by the following sets of experiments, which were made with the blackened aluminium disk insulated with ebonite, and with rock-salt in the cone.

No. of set.	No. of observations in each set.	Time at full speed, in seconds.	No. of turns of handle at full speed.	Heat indication.		Nature of gas.	Tension of gas, in inches.	Probable purity of gas (absolutely pure gas = 100).
				Divisions.	Fahr.			
VII.	2	30	22	22·5	...	hydrogen	0·6	95
VIII.	3	30	22	23·3	...	air	0·7	
IX.	2	30	20	...	0°·95	hydrogen	0·5	97
X.	2	30	20	...	0°·87	air	1·1	
XI.	3	30	20	...	0°·85	hydrogen	0·25	98·5
XII.	3	30	20	...	0°·86	coal-gas	0·25	95

(4) It may be objected to (2) that the greater heating effect from a